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Should you use acceptance or modified control charts?

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For Quality Control and Process Improvement Professionals

Should You Use Acceptance or Modified Control Charts?

Donald S. Holmes *A. Erhan Mergen*

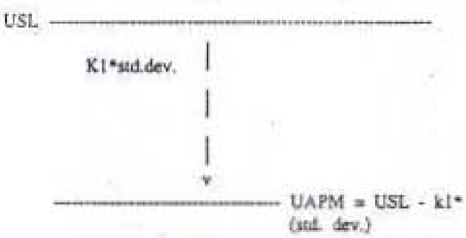
*continued from March issue of QC Report

How to build an AQL Acceptance Chart:

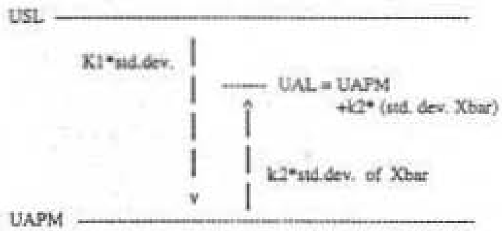
Here's how an AQL acceptance chart is constructed for subgroup sample averages. We'll use the Upper Spec Limit case to demonstrate the principal. The Lower Spec Limit case is done in essentially the same fashion.

Step 1. Decide on the AQL that you would consider appropriate for the process.

Step 2. Set a value known as the Upper Acceptable Process Mean (UAPM) at k1* (standard deviation) below the upper spec limit. If the x values are roughly Normally distributed, then using k1=2 will produce an AQL value of approximately 2.5%.



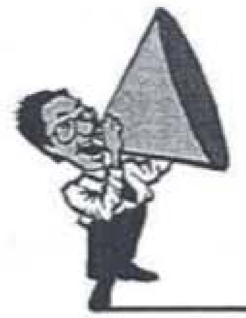
Step 3. Add k2* (Standard Deviation of Xbar) to UAPM to arrive at the Upper Acceptance Limit (UAL) for the sample Xbar. The value of k2 sets the probability of acceptance of material that has a quality level of AQL. Choosing k2 = 2 would set the probability of accepting material that has a quality level of AQL to approximately 0.975.



Remember: the standard deviation of the Xbars is the standard deviation of the x's divided by the square root of the sample size.

Equations:
UAL for Xbars for an AQL acceptance chart is calculated as:

UAL = USL - k1*(std. dev. of x) + k2*(std. dev. of x) /sqr (n)



In This Issue:

LAL for Xbars for an AQL acceptance chart is calculated as:

LAL = LSL + k1*(std. dev. of x) /sqr (n)

For an RQL acceptance chart, simply change the sign of the k2 term in these equations.

Acceptance charts are similar to acceptance sampling. In acceptance sampling we make an accept (or reject) decision on a lot based on sample(s). Acceptance charts do the same thing on a process in a dynamic fashion (i.e., over time).

Upcoming Events Calendar

July 17 - 19, 2000
Unique SPC Workshop
Statistical Analysis of Operations Data
Held at: The Center for Prof. Advancement
East Brunswick, NJ
To Register Contact: CFPA (732) 238-1600

August 21 - 24, 2000
IMS Expo 2000
New Orleans, Louisiana
Ernest N. Morial Convention Center
Booth #5316

October 23 - 27, 2000
Statistical Process Control Training
Course Director: Donald S. Holmes
Basic and Advanced Topics / 3 - 5 Day Course
October 23 - 25 Basic & October 25 - 27 Advanced
Registration: Basic $800 Advanced $1600
Location: *Stochos, Inc.*
14 N. College St.
Schenectady, NY 12305

For more information contact: Konnie Steele
(518) 372-5426, or email: Ksteele@Stochos.com

Example:

1. The output of your process is approximately Normally distributed
2. You have engineering tolerances of 50 +/- 10 and
3. You have a capability standard deviation of 1 - about 1/20th of the tolerance. Acceptance charts are a viable alternative for you!
4. You are primarily interested in supplying material which meets specs (not necessarily "in control")
5. You will be using samples of size nine to calculate Xbar.

Step 1. You want an AQL value of 2.5% - so choose k1=2

Step 2. The upper acceptable process mean is then: UAPL = 60 - 2*1 = 58

Step 3. You want a probability of acceptance of 0.975 - so choose k2 = 2 and the upper acceptable sample Xbar for sample size 9 is then: UAL = 58 + 2*1/sqr (9) = 58.67

Now reverse this procedure to find Lower Acceptable Xbar

Take LSL and add 2*std.dev. of x's to get Lower Acceptable Process mean: LAPM = 40 + 2*1 = 42

Subtract 2*std.dev. of Xbars from this value to get the lower sample average: LAL = 42 - 2/ sqr (9) = 41.33

Action: Take samples of size 9 and calculate the average (Xbar). If an Xbar is less than 58.67 and Xbar is greater than 41.33, then accept the process. Otherwise reject the process as one which is generating a 2.5% or worse quality level. You will accept your process if it is working at a quality level of 2.5%, ninety-five percent of the time.

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